R E M A R K S

Reconsideration of this application in view of the following comments is respectfully requested.

THE PRIOR ART REJECTIONS

Claims 21 and 22 were rejected under 35 USC 103 as being obvious in view of the combination of USP 6,639,543 ("Puglia") and the Federal Communications Commission Publication FCC 04-285 ("FCC"). Claims 23 and 24 were rejected under 35 USC 103 as being obvious in view of the combination of Puglia, FCC and USP 4,733,199 ("Khanna"). And claims 25-33 were rejected under 35 USC 103 as being obvious in view of the combination of Puglia, FCC, Khanna or USP 5,146,613 ("Anderson") and USP 6,668,008 ("Panasik"). These rejections, however, are respectfully traversed.

Summary of the Invention

The present invention as recited in independent claim 21 is directed to a UWB short-range radar including a transmitting unit which emits a short pulse wave which satisfies a predetermined spectrum mask from an antenna into space, a receiving unit which receives a reflected wave produced by an object existing in space of the short pulse wave emitted by the transmitting unit, and a signal processing unit which performs an analyzing process for

the object based on an output signal from the receiving unit. As recited in independent claim 21, the transmitting unit includes a pulse generator which outputs pulse signals each having a predetermined width at a predetermined frequency and a burst oscillator which receives the pulse signal output from the pulse generator and performs an oscillation operation for a time corresponding to the width of the pulse signal to output a short pulse signal serving as the short pulse wave “without causing carrier leakage”.

In addition, independent claim 21 recites that the burst oscillator comprises an oscillation unit comprising a signal inverter and a feedback circuit which delays an output signal from the signal inverter to feed back to an input terminal, and that the oscillation unit performs oscillation at a frequency determined by input/output response time of the signal inverter and delay time of the feedback circuit. As recited in independent claim 21, the burst oscillator also includes a switch circuit which sets the oscillation unit in an oscillation state only in a period in which the pulse signal output from the pulse generator is received. Independent claims 22-24, moreover, recite substantially the same features.

The burst oscillator of the claimed present invention has a unique structure which enables carrier leakage to be prevented.

As shown in Fig. 2 and described in the specification at page 21, line 5 to page 23, line 12, the burst oscillator 24 according to one example of the claimed present invention includes an oscillation unit 24a having an inverter 25 and a feedback circuit 26, with a switch circuit 24b being connected to the input terminal of the inverter 25, output terminal of the feedback circuit 26 and a ground line. The switch circuit 24b is controlled by the pulse signal Pa so that when the pulse signal is at a low-level the switch circuit 24b is closed, and when the pulse signal Pa is at a high level the switch circuit 24b is opened (see page 21, line 25 to page 22, line 4). Opening of the switch circuit 24b causes the oscillation unit 24a to operate while closure of the switch circuit 24b causes the oscillation unit 24a to stop operating. With this structure of the switch circuit 24b relative to the terminals of the inverter 25 and feedback circuit 26, closure of the switch 24b causes any oscillation from the oscillation unit 24a to pass to the ground line, and thus prevents leakage when the oscillation unit 24 is not operating.

Therefore, with the structure of the present invention as recited in independent claims 21-24, a UWB short-range radar is provided which prevents the generation of carrier leakage that invariably arises in conventional UWB radar.

The oscillation unit of Puglia differs from the present claimed invention in that it inherently continuously generates oscillations and thus causes carrier leakage.

Puglia describes a pulse-modulator 104 that receives a transmit trigger 103 to generate an "on" pulse, thereby driving a pulse oscillator 106 at a predetermined pulse width. The pulse oscillator 106 is an oscillator that has been used conventionally as an oscillator for radar, and therefore, due to the high frequency of radar, even in an off-period, an oscillation output is leaked, causing carrier leakage.

Although Puglia illustrates a transmission waveform 206 in Fig. 2 thereof that does not include leakage in the off-period, in reality, since the pulse oscillator 106 performs oscillation at all times, even in the off-period set by a pulse modulator 104, carrier leakage is inherently caused during the period intended as the off-period by the transmission waveform. That is, Fig. 2 of Puglia shows a waveform of merely an ideal state when the pulsed oscillator is operated. In the actual structure of Puglia, it is not possible to obtain a waveform without carrier leakage in the off-period.

Indeed, carrier leakage must occur in Puglia because even if the pulse oscillator 106 is switched "on" and "off" by a switch circuit, since isolation is finite in an actual electronic circuit, leakage inevitably occurs. Even if the amount of leakage

is small, since the off-time is several thousand times longer than the on-time, a power of the carrier leakage becomes very high as a result.

In support of this position, attached are Reference Figures showing a conventional structure of a UWB radar and a spectrum of thereof (from a paper presented by "Bosch" on March 20, 2001). As can be seen from the Reference Figures and accompanying text, in the electronic circuit in actuality, a high level of carrier leakage of approximately 30dB is caused.

As to the Examiner's comments relating to Puglia teaching the structure of the claimed present invention and therefore likewise operating without carrier leakage, it is respectfully submitted that Puglia does not in fact disclose a burst oscillator having the features of the claimed present invention.

In addition, it is respectfully submitted that the oscillation unit of Puglia does not operate without carrier leakage as according to the claimed present invention, and moreover, cannot be modified in view of the other cited prior art references to prevent such carrier leakage.

None of the cited prior art references disclose an oscillation unit including the features recited in independent claims 21 and 22.

According to the present invention as recited in independent claims 21 and 22, the oscillation unit comprises a signal

inverter and a feedback circuit which delays an output signal from the signal inverter to feed back to an input terminal, and a switch circuit which sets the oscillation unit in an oscillation state only in a period in which the pulse signal output from the pulse generator is received.

It is respectfully submitted that Puglia and FCC clearly do not disclose a burst oscillator having these features of the oscillation unit of the present invention recited in independent claims 21 and 22.

Anderson describes producing pulse width modulated voltage pulses corresponding to data when a data source 28 is connected to an inverting amplifier 22 by a switch 30, thereby turning an oscillator 20 on and generating bursts of RF oscillation. In contrast to the present claimed invention, however, Anderson does not disclose, teach or suggest that the switch sets the oscillator 20 in an oscillation state only in a period in which the pulse signal output from the pulse generator is received, but rather, the oscillator 20 is continually operating irrespective of receipt of a pulse signal from the pulse generator, and only its output is toggled based on the position of the switch.

Accordingly, the cited prior art references clearly do not disclose, teach or suggest an oscillation unit having the features recited in independent claims 21 and 22.

None of the cited prior art references disclose an oscillation unit including the features recited in independent claims 23 and 24.

According to the present invention as recited in independent claims 23 and 24, the oscillation unit comprises an amplifier, a resonator connected to an input unit or an output unit of the amplifier, and a feedback circuit which performs positive feedback from an output side of the amplifier to an input side of the amplifier, and a switch circuit which sets the oscillation unit in an oscillation state only in a period in which the pulse signal output from the pulse generator is received.

This embodiment is shown in, for example, Figs. 22 and 23 and described in the specification on page 43, lines 6-24. With this structure, when an oscillation operation is not started immediately after the power is supplied, a switch circuit 75 which performs a reverse operation of the operation of the switch circuit 24b is used, and the switch circuit 75 is closed in only a period in which the power supply to the amplifier 72 is stopped to cause a predetermined current to flow into the resonator 73. The switch circuit 75 is opened at a timing at which the switch circuit 24b is closed to supply a power, and a signal having a resonant frequency and generated by a transient phenomenon is generated from the resonator 73 to shift the oscillation unit 24a to the oscillation state. This operation causes current to flow

into the resonator 73 only for a period in which power supply is stopped, to be provided for oscillation. That is, Pa and Pa' are set to be opposite one another, i.e., when Pa is "on", Pa' is "off, and when Pa is "off', Pa' is "on", thereby achieving the above-mentioned operation.

With this structure, the oscillation unit is capable of operating when there is no power being supplied, i.e., the power supply is stopped. Therefore, the present invention provides an advantage of eliminating a delay at the start of an oscillation stage.

It is respectfully submitted that Puglia and FCC clearly do not disclose a burst oscillator having these features of the oscillation unit of the present invention recited in independent claims 23 and 24.

Khanna describes using the characteristic of a dielectric resonator so that spurious components are not generated, and spurious oscillation output is not directly generated. In addition, Khanna describes that signals from dielectric resonator oscillators leak through the switch to create unwanted spurious signals in the output signal (see column 1, line 67 to column 2, line 2). Khanna also describes that when a dielectric resonator is selectively coupled to the amplifier through the switch, a signal is generated (see column 2, lines 58-60) and an amplifier is always turned on to cause signals to be generated upon

selection of one of the dielectric resonators (see column 2, line 67 to column 3, line 2).

It is respectfully submitted, therefore, that Khanna clearly discloses an oscillator having a significantly different structure than the burst oscillator of the present claimed invention as recited in independent claims 23 and 24, and that Khanna cannot achieve the above described advantageous effects of the claimed present invention.

Conclusion

The cited prior art references not disclose, teach or suggest a burst oscillator having the structural features of the claimed present invention. Namely, the cited prior art references do not disclose, teach or suggest a burst oscillator which receives a pulse signal output from a pulse generator and which performs an oscillation operation for a time corresponding to the width of the pulse signal to output a short pulse signal serving as the short pulse wave without causing carrier leakage, as according to the present invention as recited in independent claims 21-24.

Accordingly, it is respectfully submitted that independent claims 21-24, and claims 25-33 depending therefrom, clearly patentably distinguish over the cited references, taken singly or in combination, under 35 USC 102 as well as under 35 USC 103.

In view of the foregoing, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

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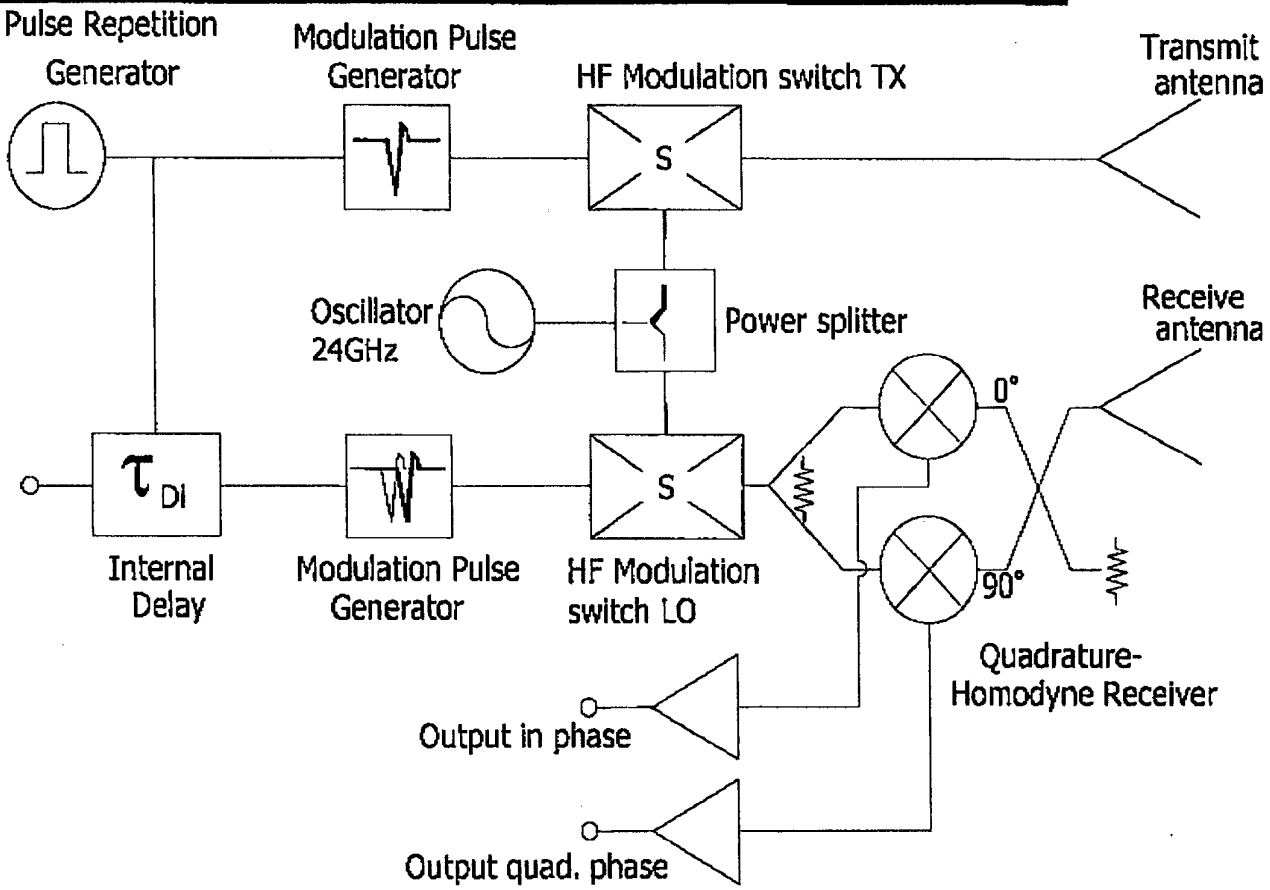
DH:br/bl
encs.

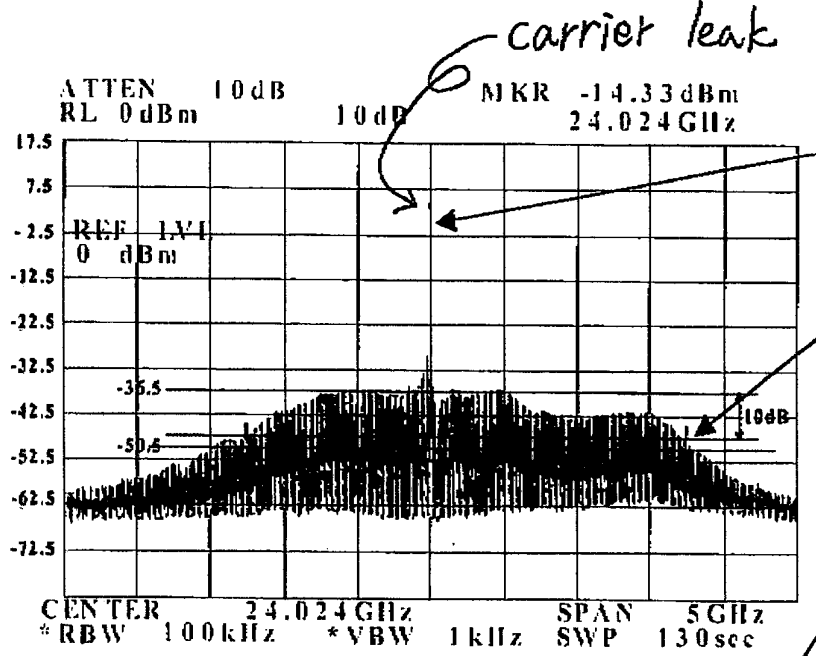
SRR basic technical concept

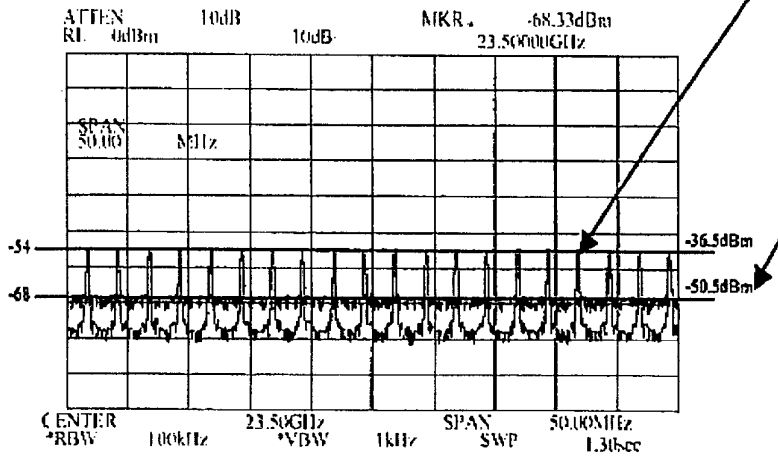
BOSCH



- **Pulse Doppler Radar with Amplitude Modulation on 24 GHz carrier**
- **„Time of flight" measurement based on „equivalent time sampling" principle**
- **High receiver processing gain (Pulse Correlation & Integration), which allows ultralow emission power**
- **smoothed spectral power distribution due to pseudorandomized pulse repetition**

BOSCH





Residual carrier due to limited AM index

Abs. Bandwidth 3GHz @-10dB
fractional BW appr. 12.5%
(per definition WB or UWB ?)

Comb lines of unsmoothed spectrum placed -6dB below power limit for spurious emissions (-30dBm)

Power density of smoothed spectrum (appr. -100dBm/Hz)
Emissions drop below thermal noise (kT= -174dBm/Hz) at distance of 5m for isotropic receivers

No emissions below 20 GHz
Traditional VHF/UHF bands are not affected

Reference Figure
2 of 2